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PALPARES TURCICUS KOÇAK, 1976 – NEW NAME FOR IRANIAN FAUNA AND ITS PLACE IN THE *P. LIBELLULOIDES* SPECIES GROUP (NEUROPTERA: MYRMELEONTIDAE)

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ABSTRACT

We have determined in the Iranian Research Institute of Plant Protection collection of two closely related species: *Palpares libelluloides* (Linnaeus, 1764) and *P. turcicus* Koçak, 1976 from Iranian provinces of Azarbayjan Sharghi, Kermanshah, Fars, Tehran, Kordestan, Markazi, Zanjan, and Lorestan, which are never recorded together in the same biotopes. New records of *P. turcicus* and other species of *P. libelluloides* species group from the countries of Transcaucasia, Asia, and Africa are presented based on the collection of the Zoological Institute of the Russian Academy of Sciences (ZIN). In the *P. libelluloides* species group, *P. libelluloides* is characterized by yellow abdomen with brown longitudinal lines. Abdominal pattern of *P. hispanus* Hagen, 1860, *P. aeshnoides* (Illiger, 1807) and *P. turcicus* is represented by brown rings on each segment, but these species can be easily differentiated from each other by size. The widely-allopatric species *P. geniculatus* Navás, 1912 and *P. speciosus* (Linnaeus, 1758) are characterized by entirely yellow abdomen without brownish pattern. The latter two species have mainly Afro-subtropical distribution, whereas other species of the group are West Palaearctic, mostly Ancient-Mediterranean species. The traditional name *Palpares libelluloides* (Linnaeus, 1764) is proposed to include into the List of Available Names in Zoology in accordance with the Article 79 of ICZN. This species is considered as *P. libelluloides* sensu stricto; its confirmed synonyms are *Myrmeleon nordmanni* Kolenati, 1846 (an immature form), and var. *nigriventris* A. Costa, 1855 and var. *nigripes* Navás, 1912 (melanistic specimens), which do not form natural populations. The neotype of *Myrmeleon aeshnoides* Illiger in Rossi, 1807 (Jerusalem, Romanov's collection, ZIN), and the neotype of *Hemerobius speciosus* Linnaeus, 1758 (the collection of the Linnaean Society of London, № 2352) are designated.

Key words: ant lions, distribution, key for species, *Palpares libelluloides* species group, systematics

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PALPARES TURCICUS KOÇAK, 1976 – НОВОЕ УКАЗАНИЕ ДЛЯ ФАУНЫ ИРАНА И ЕГО МЕСТО В ВИДОВОЙ ГРУППЕ *P. LIBELLULOIDES* (NEUROPTERA: MYRMELEONTIDAE)

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РЕЗЮМЕ

В коллекции Иранского института защиты растений в сборах из одних и тех же провинций (Иранский Азербайджан, Керманшах, Фарс, Тегеран, Курдестан, Маркази, Заньян, Лорестан) определены два близких вида *Palpares libelluloides* (Linnaeus, 1764) и *P. turcicus* Koçak, 1976, не встречающиеся совместно. При этом для *P. turcicus*, а также для других близких видов из видовой группы *P. libelluloides* приведены ранее неизвестные находки из Закавказья, ряда стран Азии и Африки по материалам коллекции Зоологического института Российской академии наук (ZIN). В отдельной группе близких видов *P. libelluloides* отличается рисунком брюшка, состоящим из продольных бурых полос на желтом фоне. Рисунок брюшка у *P. hispanus* Hagen, 1860, *P. aeshnoides* (Illiger, 1807) и *P. turcicus* представлен поперечными бурыми кольцами на каждом сегменте, а между собой эти виды хорошо различаются по размерам. Аллопатричные между собой, и близкие к *P. libelluloides* виды *P. geniculatus* Navás, 1912 и *P. speciosus* (Linnaeus, 1758) характеризуются желтым брюшком вообще без бурого рисунка. Последние два вида имеют преимущественно афро-субтропическое распространение, в то время как остальные виды группы – западнопалеарктические, большей частью древне-средиземноморские. Традиционное название *Palpares libelluloides* (Linnaeus, 1764) предложено для включения в список пригодных названий в зоологии в соответствии со статьей 79 МКЗН. Этот вид рассматривается как *P. libelluloides* sensu stricto; его подтвержденные синонимы: *Myrmeleon nordmanni* Kolenati, 1846 (имматурная форма) и var. *nigriventris* A. Costa, 1855 и var. *nigripes* Navás, 1912 (меланизированные экземпляры), которые не образуют природных популяций. Выделены неотип *Myrmeleon aeshnoides* Illiger in Rossi, 1807 (Иерусалим, коллекция Романова, ЗИН) и неотип *Hemerobius speciosus* Linnaeus, 1758 (коллекция Линнеевского общества Лондона).

Ключевые слова: муравьиные львы, ключи для видов, видовая группа *Palpares libelluloides*, систематика

INTRODUCTION

Hemerobius speciosus Linnaeus, 1758 and *H. libelloides* Linnaeus, 1764, the bright-coloured broad-winged ant lions (Neuroptera, lacewings), were originally described by Carl Linne from South Africa and South Europe, respectively. These species were often mixed in subsequent works after the first erroneous record of the European species from Cape Bona Spei by Linnaeus (1788). Later Rambur (1842) included 11 species (including both these Linnean taxa) in the genus *Palpares*, and retained *Palpares libelluloides* (Linnaeus, 1764) combined in the cited and Spanish distribution. Similar in their bright appearances, ant lions have been frequently determined in natural collections (Linnaeus 1764, 1788; Fabricius 1793; Latreille 1802), as *Myrmeleon libelluloides* was misidentified with other Palparinae such as *P. speciosus*

(Linnaeus, 1758). Both species were distinguished by some specialists, e.g. Charpentier (1825), Burmeister (1839), though a large number of other species remained members of *P. libelluloides* until the 21st century. Aspöck et al. (1980) considered *P. libelluloides* a combined species '*sensu lato'* including species, which were synonymized with *P. libelluloides*. Some of these species later (Krivokhatsky 2011) were placed into the *Palpares libelluloides* species group containing *P. hispanus* Hagen, 1860, *P. aeshnoides* (Illiger, 1807), *P. turcicus* Koçak, 1976, *P. speciosus* and *P. geniculatus* Navás, 1912. A historical review of the group was prepared by Ábrahám (2012) who unnecessarily replaced the name of the genotype.

Mirmoayedi et al. (2015) prepared a check-list of the antlions of Iran with the inclusion of *Palpares libelluloides* sensu lato.

In the Catalogue of World Myrmeleontidae, Stange (2004: 55) without citing Whittington (2002), has "firstly" restored the primary transcription *Palpares libelloides* (Linnaeus, 1764) for the species *Palpares libelluloides* (Linnaeus, 1767), which was in fact an erroneous name. Restoring the name "*libelloides*" appears to be in violation of ICZN, §11 in Introduction of which (Fourth edition) stated that: "An author will be required (without a ruling by the Commission) not to displace a name which has been used as valid by at least 10 authors in 25 publications during the past 50 years, and encompassing a span of not less than ten years, by an earlier synonym or homonym which has not been used as valid since 1899." This issue has been previously argued and discussed (Krivokhatsky 2005). For that case another article of the Code can be attributed: "33.3.1., when an incorrect subsequent spelling is in prevailing usage and is attributed to the publication of the original spelling, the subsequent spelling and attribution are to be preserved and the spelling is deemed to be a correct original spelling". Indeed, Linnaeus (1767) rewrote the name of the species in order to correct the original description (1764). Hereby, the name "*libelluloides*" should be considered as a valid primary name; because the name was fixed for genotype species (not topotype, as Ábrahám cited!) of the genus *Palpares* Rambur (Chenu and Desmarest 1859). Ábrahám (2012) cited these arguments; nevertheless, he treated the name *Palpares libelluloides* as 'traditional', but mentioned *Palpares libelloides* as a 'valid' name. We offer to close the discussion for the benefit of the traditional name, used by Linnaeus, Fabricius, Rossi, Latreille, Olivier, Blanchard, Hagen, Walker, Costa, Rambur, Schneider, Brauer, McLachlan, Kolbe, Banks, Klapálek, Navás, Esben-Petersen, all our pioneer in Palparinae.

The name *Palpares libelluloides* (Linnaeus, 1764) should be admitted as valid and must be included in the List of Available Names in Zoology in accordance with the Article 79 of ICZN.

Institutional abbreviations. BMNH, British Museum (Natural History), London, England; IRIPP, Iranian Research Institute of Plant Protection, Tehran, Iran; ZIN, Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia; USMB, Upper Silesian Museum in Bytom, Bytom, Poland.

MATERIAL AND METHODS

227 specimens of 6 species from *Palpares libelluloides* species group from Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZIN) and Iranian Research Institute of Plant Protection, Tehran, Iran (IRIPP) were examined. Related photos were prepared using different cameras. Size of antlions indicated in the text refers to the length of costal direction of forewing and differs from the linear scale in the total pictures, which is shown in the horizontal direction (Fig. 1). Preparations of genitalia have been made in variable concentration

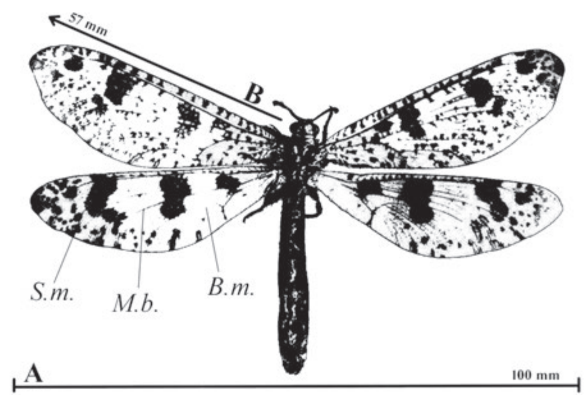


Fig. 1. *Palpares libelluloides.* Wing pattern and two variants for measurement of antlions size. (Female – France, Bretagne, 20–21 July 2000, A.A. Nekrasov). *Abbreviations: a. s.* – apical spot; *S. m.*– stigmal macula; *M. b.* – medial band; *B. m.* – basal (media-sectoral) macula of hind wings; A – body comparative scale; B – scope of fore wing lengths.

of KOH; as a consequence of different conditions the macerations of muscles inside gonarcus and other structures increased. Because of that reason cone-shaped gonarcus and pyramidal hypandrium became transparent and untypically membranous.

A wide synonymy proposed by early researchers for *Palpares* spp. is not associated with the morphological similarity of the examined specimens, but rather with their overlapping interspecific variability. Scrupulous investigation leads to the typological conception in those taxa of lacewings. In the revision of the genus *Palpares*, Rambur (1842) devoted entirely full page (p. 370–371) to a comparative description of *Palpares speciosus* (Linnaeus, 1758), which he determined from Cap bona spei [Cape of Good Hope]. At the same time, cap de Bonne-Espérance was reserved by him for *libelluloides*, var. A (p. 268), and later became *Palpares hispanus*. It was the first incongruity that required to combine the typological conception in taxonomy with zoogeographic delimitation approach (see above).

In the beginning of our research, one hypothesis did need to be verified: as there were no conjointly inhabited species in the *Palpares libelluloides* species group. Therefore, the old collections of ZIN from the Caucasian region and special collections of Palparinae from NW Iranian Provinces from IRIPP were examined. There was no locality where any pair of species from this group occurs simultaneously. By the end of researches we successfully formulated the pattern of distribution for species of the *P. libelluloides* species group: Even if some species are sympatric, they never inhabit the same biotopes and thus are isolated from each other at the landscape level.

SYSTEMATICS

Family Myrmeleontidae Latreille, 1802

Subfamily Palparinae Banks, 1911

Genus *Palpares* Rambur, 1842

Palpares Rambur, 1842: 365.

Type species. "*Palpares libelluloides*" by subsequent designation of Hagen, 1873:390 – from Oswald and Penny, 1991: 47; = "*Hemerobius libelloides* Linnaeus" by subsequent designation of Chenu and Desmarest, 1859:112 as "*Myrmeleo libelluloides*" – from Stange, 2004: 47.

Palpares libelluloides species group

Palpares libelluloides species group besides nominative species includes *P. hispanus*, *P. aeshnoides*, *P. turcicus*, *P. speciosus* and *P. geniculatus*.

Banks (1913) in addition to *libelluloides* group (*papilionoides, hispanus, percheroni* and *tessellatus*) distinguished African *speciosus* group (*digitatus, caffer, varius, stuhlmanni,* and *dubiosus)* and placed *Palpares geniculatus* between *pardaloides* and *hispanus*. The *libelluloides* group has been assembled by Krivokhatsky (2011) from the list of closely related species which often were synonymized with each other and considered as the combined species *Palpares libelluloides* sensu lato. The review of the *Palpares libelluloides* species group has been prepared by Ábrahám (2012). He confined the study to the fauna of Levant, Iraq and West Iran in which he attributes the species *Palpares papilionoides* (Klug, 1834) from the present *tristis* group to the *Palpares libelluloides* species group after incorrectly citing publication of Krivokhatsky (2011).

Synonymy within the *Palpares libelluloides* species group

Synonymy of *Libella turcica* Petiver, 1702 with *P. libelluloides* sensu stricto by Fabricius (1784) is very questionable because different species of the taxa can occur at the type locality (Aleppo – [Haleb]), and the type of Petiver is definitely waste since 1702.

Synonym *Myrmeleon nordmanni* Kolenati, 1846 for *P. libelluloides* was suggested by Hagen (1858) and confirmed for *P. libelluloides* sensu stricto by Krivokhatsky (2003) with lectotype designation (see below).

A synonymy of *Palpares chrysopterus* Navás, 1912 with *Palpares libelluloides* was established by Banks (1913a) and confirmed by Aspöck et al. (1980), who proposed *P. libelluloides* sensu lato. Later, this name was excluded from synonyms, and the species *Palpares chrysopterus* was treated as a valid species (Ábrahám 2012), although it had been described by Navás twice on the basis of different series of syntypes from different topotypes. That case of broken name is considered in the present paper in Discussion for *Palpares turcicus*.

The species group can be characterized by features of similar wing pattern (Fig. 1), equal form of

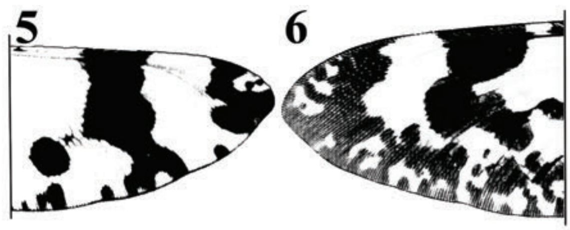
tibial spurs and ectoprocts of male, identical position of paired parameres onto the tip of gonarcus and pyramidal hypandrium internum in male genitalia. Unfortunately, hypandrium internum is almost inaccessible and cannot be illustrated. Body size, wingspan, colour and shape pattern on abdomen and wings vary within the group. Their interspecific variability is described below.

Key to the species of *Palpares libelluloides* L. species group

– Abdomen entirely yellow (Fig. 2) 1
– Abdomen yellow with brown drawing 2
1. Wings pale pictured, widely lanceolate. One brown end point between the apical spot and stigmal band of hind wing (Fig. 5). Medial macula in hind wing small . . . . *P. geniculatus* Navás, 1912 (N-E. Africa, Asia Minor)
– Wings pictured with contrast drawings, narrow lanceolate. Large brown pattern between the apical spot and stigmal band of hind wing (Fig. 6). Media-sectoral macula in hind wing looks like long band, wide and contrast . . . . *P. speciosus* (Linnaeus, 1758) (Cape)
2. Abdomen drawing forms with longitudinal lateral brown lines on yellow background (Fig. 3). Sectoral macula and both bands of hind wings dark and contrast . . . . *P. libelluloides* (Linnaeus, 1764) (Mediterranean S. Europe, W. Asia and N. Africa)
– Abdomen yellow with brown rings on each segments (Fig. 4) 3
3. Grow larger, forewing – 50–67 mm. The sectoral macula in hind wings variously sized: from small speck upon cubitus to large macula, covered both forks. Tip of wings round shaped . . . . *P. turcicus* Koçak, 1976 (W. Asia)
– Medium sized, or smaller. Tip of wings gently falcate. Sectoral macula in hind wing large and contrast 4
4. Medium sized, forewing – 45–50 mm . . . *P. hispanus* Hagen, 1860 (Western Mediterranean Europe and Africa)
– Smaller sized, forewing – 30–35 mm. Sectoral macula in hind wing large and contrast . . . . *P. aeshnoides* (Illiger, 1807) (Eastern Mediterranean Asia and Africa)



Figs. 2–4. Abdomen of female. 2 – *Palpares speciosus*; 3 – *P. libelluloides*; 4 – *P. turcicus*. Out of scale.



Figs. 5–6. Tip of hind wing. 5 – *Palpares geniculatus*; 6 – *P. speciosus*. Out of scale.

Palpares libelluloides (Linnaeus, 1764)

Hemerobius libelloides Linnaeus, 1764: 401;

Myrmeleon libelluloides (Linnaeus) – Linnaeus, 1767: 913 (misspelling); Fabricius, 1775: 311; 1784: 398; 1787: 249; 1793: 92; Villers, 1789: 57; Illiger (in Rossi), 1790: 14; Rossi, 1790: 14; 1807: 17; Latreille, 1807: 191; Olivier, 1811: 121; Dalman, 1823: 88; Charpentier, 1825: 51; Westwood, 1837: 1: 104; Blanchard, 1845: 305; Hagen, 1845: 156; Walker, 1853: 305; Costa, 1863: 64;

Libella turcica Petiver, 1702: 111; Fabricius, 1784: 398 (syn.); Stange, 2004: 55 (syn.);

Myrmeleo libelluloides (Linnaeus) – Latreille, 1802: 29; Chenu and Desmarest, 1859: 112 (genotype);

Myrmeleon libelloides (Linnaeus) – Ehrenberger, 1836: 18;

Myrmeleon libeluloides (Linnaeus) – Blanchard, 1840: 65;

Palpares libelluloides (Linnaeus) – Rambur, 1842: 365; Schneider, 1845a: 154; 1845b: 341; Brauer, 1854: 472; 1857: 63; 1876: 278; Hagen, 1858: 124; 1866a: 434, 442, 456; 1866b: 288; Chenu and Desmarest, 1859: 112 (genotype); Stein, 1863: 420; Pictet, 1865: 75; McLachlan, 1867: 275; 1898: 249; Kolbe, 1884: 135; Mocsary, 1899: 41; Klapálek, 1900: 682; 1906: 95; Navás, 1900a: 96; 1904b: 10; 1906b: 101; 1907a: 100; 1912r: 20; 1913c: 3; 1913g: 82; 1913k: 67; 1913m: 80; 1914g: 719; 1914m: 276; 1914o: 6; 1915a: 61; 1915b: 29; 1916c: 154; 1924b: 376; 1925d: 22; 1926d: 112; 1927a: 6; 1930g: 160; 1932a: 914; 1932b: 4; Banks, 1911: 4; 1913a: 183; Esben-Petersen, 1913a: 287; 1913b: 26; 1918b: 106; 1933: 165; Aspöck et al., 1980: 284; 2001: 226; Krivokhatsky, 1998: 86; 2011: 93; Mirmoayedi et al., 1999: 55; 2015: 2; Mirmoayedi, 2002: 200; Aspöck,

2002: 169; Letardi, 2002: 228; 2004a: 199; 2004b: 295; Aspöck and Aspöck, 2003: 573; Letardi and Biscaccianti, 2007: 109;

Myrmeleon nordmanni Kolenati, 1846: 115; Hagen, 1858: 124 (syn.); 1866a: 445 (syn.); Esben-Petersen, 1913a: 287 (syn.); Krivokhatsky, 2003a: 229 (lectotype design.);

Myrmeleon libelulloides (Linnaeus) – Blanchard, 1845: 305;

Myrmeleon libelulloides v. *nigriventris* A. Costa, 1855: 6, 20; Pantaleoni, 1999: 257 (syn., as nomen dubium); Aspöck et al., 2001: 320 (nom. dubia);

Myrmecoleon libelluloides (Linnaeus) – Burmeister, 1838: 998; Hagen, 1866: 433;

Myrmileon libelluloides (Linnaeus) – Comas, 1870: 25;

Palpares chrysopterus Navás, 1912: 14; Banks, 1913a: 183 (syn.); Aspöck et al., 1980: 284 (syn.);

Palpares libelluloides var. *nigripes* Navás, 1912f: 182; 1914g: 749; 1915a: 62; Steinmann, 1967: 80; Monserrat, 1985: 242; Devetak, 1992: 113 (syn.);

Palpares libelluloides Rambur (sic!) – Steinmann, 1967: 79; Kozhanchikov, 1958: 378 (photo);

Palpares libelloides (Linnaeus) – Whittington, 2002: 385; Stange, 2004: 55; Mirmoayedi, 2006: 52.

Distribution. Europe: Spain, South France, Italy, Slovenia, Croatia, Montenegro, Serbia, Albania, Greece, Romania, Bulgaria, Asia: Cyprus, Turkey, Russia (Dagestan), Georgia, Armenia, Azerbaijan, Syria, Israel, NW Iran, Africa: Tunisia, Marocco, Algeria. Wide spread East-Mediterranean species with two distinctive main parts: South European and Caucasian.

Material. 148 specimens examined.

IRIPP: Iran: 2 males: Azarbayjan Sharghi Prov., Jolfa, Daradiz, 1300 m, 4 August 1997, Nazari; 1 female: Azarbayjan Sharghi, Minab, 1080 m, 7 July 1997, Barari, Mofidi; 1 male: Kermanshah Prov., Kermanshah, 18 June 1975, Abai; 1 male: Fars Prov., Kazerun, Gav Koshak, 26 June 1976, Abai; 1 male: Fars Prov. Kazerun, Cheshmenari, 900 m, 6 May 1985, Mirzayans; 1 male: Tehran prov., Taleghan, Sabzan, 1550 m, 1 September 1996, Badii, Mofidi; 1 male: Markazi Prov., Gharghabad, Ghazemabad, 1800 m, 21 August 2009, Hajiesmailian, Mofidi; 3 males: Zanjan Prov., Zanjan, Gilvan, Jeyshabad, 1301 m, 20 July 2010, Alipanah, Falsafi.

ZIN: France: 1 female, Bretagne, 20–21 July 2000, A.A. Nekrasov; Italy. 1 female, 'Palpares papilionoides, Neapol, Staudinger', '*Palpares libelluloides* Rambur [Kolenati det.]';

Greece: 1 male, '*Palpares libelluluides* Corfu Erber hh [Eversmann det.]'; 3 males, 2 females, Chalkis, Eubea, May 26, 2 June 1926, Holtz;

Montenegro: 1 female, Umgebung um Podgorica, September–October 1889, Führer;

Croatia: 1 male, 2 females, Adriatic coast of Yugoslavia, swamp meadow, 9 July 1965, S. Matveev;

Bulgaria: 1 male, Kresnensko defile, 8 July 1964, Hr. Lukov, '*P. libelluloides*, A. Popov det.';

Georgia: 1 male, Eldar along Iora River, Signakh env., Tiflis Gub., 13 July 1896, A. Mlokosiewicz; 2 males, Sulawezi [Schulaweri], Tifl. G., Schuposch. [Kh.G. Shaposhnikov];

Russia, Dagestan: 1 female, Derbent, July 1901, L. Bianchi, '*P. libelluloides*, E. Luppova det.'; 1 male, Derbent, 2 July 1925, A.N. Kirichenko; 1 male, Agach-aul, 30 June 1990, A. Zaguljaev; 1 female, Tarki, 4 July 2013, G. Khabiev (wet collection);

Azarbayjan [Azerbaijan]: 1 male, "Myrmeleon [Percheronii (strikeout)] Nordmanni (added above), Caucasus" [Elisabethpol], 'Myrmeleon nordmanni Kolenati, lectotype designation by Krivokhatsky, 2003', '*P. libelluloides*, Krivokhatsky syn.'; 1 male, Elisabethpol, 1923, L. Bianchi, E. Luppova det.; 1 male, Kyzyl-Agach Natural Reserve, 16–17 July 1988, A.V. Gorokhov; 2 males, 5 females, Alpaut, Mugan, close Persian bondary, 12–15 August 1910, K.A. Satunin; 1 male, Dash-Burun, Milskaya steppe, Azerbaijan, 8 June 1941, L. Mischenko; 1 male, Divichi env., 1 July 1962, V.A. Trjapitsin; 2 males, 2 females, Dzgafarlakh, Saliany distr., Baku Reg., 5 July 1925, L. Bianchi; 1 male, Dzgafarkhan, Saliany distr., Baku Reg., 21 July 1925, L. Bianchi; 1 male, Sangachaly station, Baku Reg., 16 June 1909, N. Panov; 1 male, Gandzin env.[Baku Reg.], Kara-Chai River, 20 July 1933, F.K. Lukianovich; 1 female, Caucasus, Kr. Aresch, E. Koenig; 1 male, Bartis on Arax, 3 June 1914, von Vik; 6 males, 9 females, between Evlakh and Barda, Elisavatpol gub. [Gandzha], 30 June 1916, A.N. Bartenev; 6 males, 3 females, Geoktapa Elisavatpol gub. [Gandzha], arc-heated lamp, 14–15, 24, 26, 29, 30 June, 02 July 1901, R.G. Shmidt; 1 female, Geok-Tapa, Caucasus, A. Shelkovnikov; 1 sp. without abdomen, Geoktapa, Aresh distr., Elisavatpol gub., 17 June 1915, L. Bianchi; 1 female, Zanschurskyi uezd, Elisavatpol gub., 12 June 1913, A.N. Bartenev; 1 male, Margushevany [Leninavan], glade at the grain steppe, 5 July 1925, P.A. Veltischev; 1 male, Etykchi [Eshshakchi, Zahmetchi], Lenkoran uezd, 4 July 1909, A.N. Kirichenko; 2 females, Eshakchi [Zahmetchi], 3 June 1904, A.N. Kirichenko;

Armenia: 1 male, Hosrov Natural Reserve Vedi distr., 1300–1500 m, 13 July 2003, A.G. Koval; 1

male, Hosrov Natural Reserve Garni vil., 8–13 August 1988, P.V. Romantzov; 1 female, Megri distr., 800 m, 20–21 July 2003, A.G. Koval; 3 females, Megri, 17 July 1956, 27 July 1957, V.A. Richter; 1 female, Nyuvadi on Arax, 10 July 1931, M.A. Ryabov; 1 male, Zangazur, Goris-Kafan, 6 August 1952, I.S. Darevskyi; 1 female, val. Arax, prop Asiazur, 8 July 1926, A.V. Shelkovnikov; 1 female, Ararat prov. Env. Lanjar vill. N 39.81887 E44.98507, 1796m, 18 August 2016, A. Danchenko (wet collection); 1 female, Ararat prov. Env. Dashkatar vill. N 39.92319 E 44.74741, 965 m, 06 August 2016, Karagyan (wet collection);

Turkey: 1 female, Turkish Armenia, Dom vil. (Tuom), Mush env., 11 July 1916, I.E. Andreevskyi; 1 male, 3 females, 1 sp. without abdomen, Dom vil., Mush env., 17 July 1916, I.E. Andreevskyi; 1 male, Bogdan-Gidichi Pass, Musha River, 14 July 1916, P.K. Kuchinskyi; 1 female, Burdur prov., 22.4 km SE of Isparta, 672 m, 26 June 2006, B. Korotyaev; 1 female, Ankara prov., 19 km. E of Sevefli-Koc bisar, 23 June 2005, M. Volkovich; 1 male, Adana, 78 km. SW Paranti, 29 June 2005, M. Volkovich; 1 female, Adana, Pozanfi env., 12 June 1999, M. Volkovich, M. Dolgovskaya; 1 male, Malafya, 20 km E of Elasig, 9 June 1999, M. Volkovich, M. Dolgovskaya; 1 male, '*Palpares libelluluides* Reg. Mersina, 1.50 [Eversmann det.]';

Israel: 1 male, 1 female, loc. № 23, Carmel Ridge, 56, Isfyia env., Mt. Carmel, 19 July 1996. V.F. Zaitzev; 1 male, 1 female, loc. № 23, Mt. Carmel, Isfyia env., 19 July 1996, M.G. Volkovich, M.Yu. Dolgovskaya;

Iran: 1 male, 1 female, Azerbaijan, 15 km SW Zanjan, 12 July 2004, V. Lukhtanov; 1 female, W. Azerbaijan, 600 km W Urmiya, 27 July 2004, V. Lukhtanov; 1 male, NW Persia, Dzhabadara, Karadagh, 21 June 1914, von Vik; 1 male, Tegeran, Elbans Geb., 1903, Valter, 'Palpares libelluloides Ramb. [Kolbe det.]'; 2 males, 1 female, Latian-Dam, 50 km E. of Tehran, 28 June 2000, Yu. Marusik; 1 sp. without abdomen, Luristan, Abbasan-Sheih, Nazrad, 16 May 1914, N.S. Nesterov; 1 male, W. Persia, Luristan, Abbasan-r-Kani River, Bamu, 13 May 1914, N.S. Nesterov; 1 male, Torosh, Sargad, Bampur, 29 June 1901, N. Zarudnyi; 3 males, 2 females, Kuusha vil., Sargad, Bampur, 2–5 May 1901, N. Zarudnyi; 1 male, 2 females, Karvandar, Bampur, 25 April 1901, N. Zarudnyi; 1 male, Nakhi-Bendan, Khorasan, 26-[30] June 1901, N. Zarudnyi; 1 male, 2 females, Gjakh-Kum, 10 km S of Khadzhi-Abad, 7 May 1955, D. Shteinberg (Zakharenko det.); 1 male, 50 km S of Khadzhi-Abad, 26 April 1955, D. Shteinberg (Zakharenko det.); 1 female, North slope of Kugi-Taftan, 25 May 1955, D. Shteinberg (Zakharenko det.);

Iraq: 4 males, 6 females, 1 sp. without abdomen, Biare village, Mosul, Mesopotamia, 3–6 June 1914, N.S. Nesterov.

Notes. In the present work, material of *P. libelluloides* from Iran is listed from the collections of ZIN and IRIPP only. For other collections and places material has been published previously (Mirmoayedi et al. 1999; Mirmoayedi 2002). Studied specimens, collected in Russia also were published (Krivokhatsky 2011).

Synonymy. Among the junior synonyms of *Palpares libelluloides* s. str. we declare the validity of the following taxa:

1. *Myrmeleon libelulloides* v. *nigriventris* A. Costa, 1855 – syntypes (in Napoli) figured and synonymized by R. Pantaleoni (1999).

In the next revision of Costa collection, Pantaleoni (2005: 85) listed specimens from both, nominative and melanistic variations:

"Palpares libelluloides (Linnaues, 1764);

Myrmeleon libelluloides: colline vicine alla capitale [Napoli state] (1855b: 5 and 20, taf. VIII, fig. 1); *Myrmeleon libelluloides*, Lin.: Napoletano 2 exx (1871b: 14, n. 162);

Myrmeleon libelluloides, Lin.: in varii luoghi, fin nell'Aspromonte (1863: 64, n. 639); *Myrmeleon libelluloides*, Lin.: adiacenze di Cirò [13–22 luglio 1876]. (1881: 52);

[Myrmeleon libelluloides] var. *nigriventris*: Calabrie (1855b: [6] and 20);

1♂ – M. Zool. n. 7794 \ *Palpares libelluloides* ♂ L. Navás S.J. det \ M. libelluloides M. nuovo [N];

1♂ – *Palpares libelluloides* ♂ L. Navás S.J. det [N];

1ex – *Palpares libelluloides* ♀ L. Navás S.J. det [N];

The M.[onte] Nuovo locality is in the Campi Flegei near Naples. Many specimens reported by Achille Costa are missing from the Collection".

2. *Palpares libelluloides* var. *nigripes* Navás, 1912f: 182; 1914g: 749; 1915a: 62; Steinmann, 1967: 80; Monserrat, 1985: 242; Devetak, 1992: 113 (syn.) (V. Krivokhatsky has examined syntypes in Budapest in 2000 and confirms synonymy).

A negligible variation in size, intensity and tinge of body spots (from brown to black) is very characteristic of the species within *Palpares libelluloides* species group. Variation is more melanistic in the head of var. *nigriventris* and in the abdominal sclerites

of var. *nigripes*. Infraspecific nomenclature taxa (*nigriventris* and *nigripes*) from typological concept are the extreme forms in the row of phenes in melanistic gradient. There are no biological taxa associated with these names because similar forms can occur in different geographic populations. Both melanistic variations and typical forms likely occur near Naples.

3. *Myrmeleon nordmanni* Kolenati, 1846 – lectotype from Azarbayjan [Gaendscha] (Krivokhatsky 2003a) kept in ZIN. The synonymy of *M. nordmanni* with *P. libelluloides* was established by Hagen (1858), using the original description of *M. nordmanni* giving no indications on the examination of the type material. One syntype, a well-preserved male, is found in ZIN collection. The specimen (Fig. 8) is provided with the printed label "Dr. Kolenati" and a handwritten label with a red margination "*Myrmeleon* [*Percheronii* (strikeout)] *Nordmanni* (added above), Caucasus." For the purpose of the stability of the nomenclature, this specimen was designated as the lectotype of *M. nordmanni* (paralectotypes have not been found yet); the synonymy of this species with *P. libelluloides* was confirmed by Krivokhatsky (2003). The type locality of the taxa described by Kolenaty has been outlined "Provinciae trans Caucasum sitae Elisabethpol, ad pedem montis Ssarijal et Gaendscha-Dagh" (Kolenati 1846, p. 117).

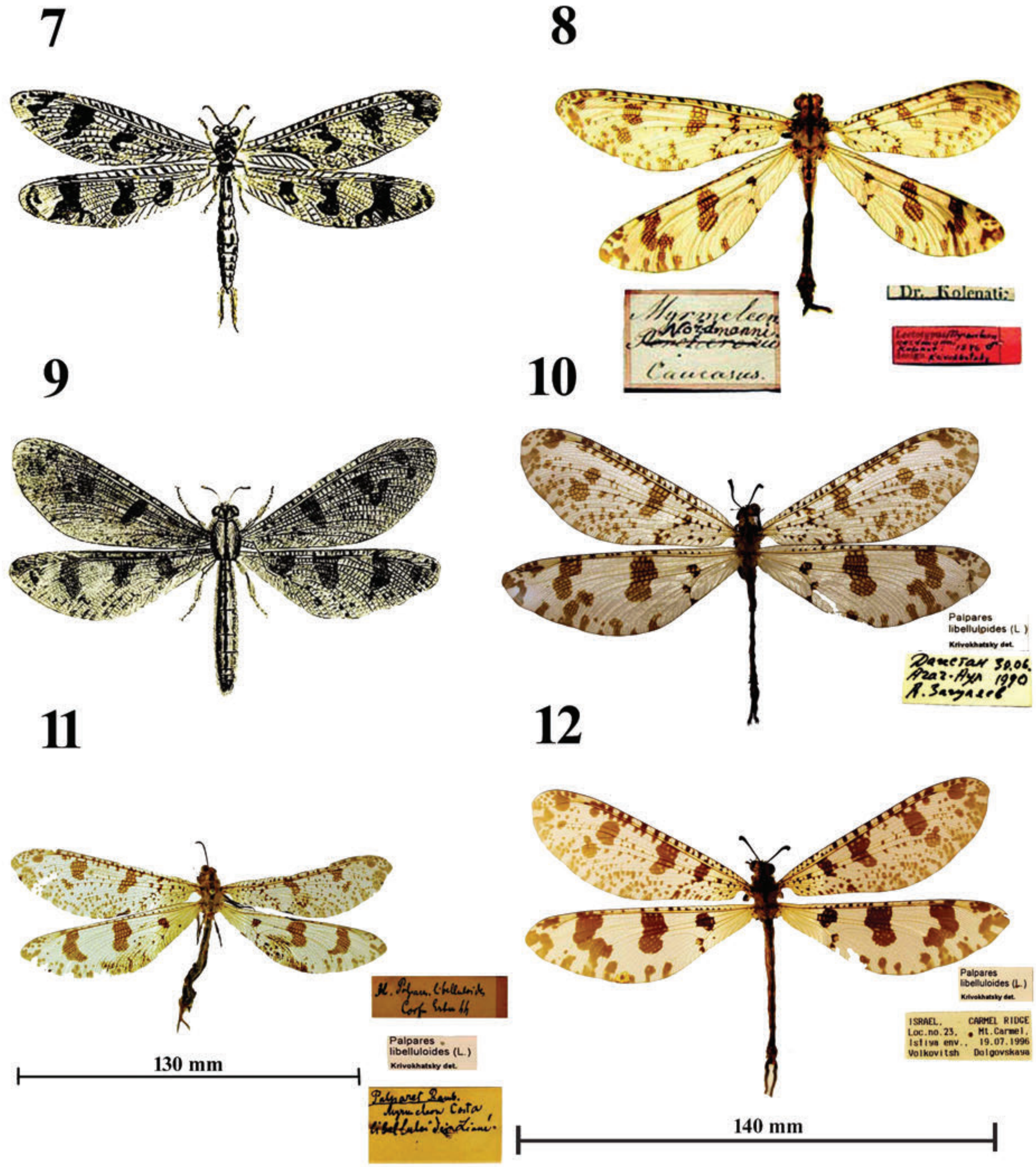
Chenu and Desmarest (1859) designated *Palpares libelluloides*. The species was depicted recognizable (Fig. 9) together with the imprint of other specimen from Percheron collection (Fig. 7). The description contains only one mention of Percheron (Chenu and Desmarest 1859, p. 117): "Les larves de ces Névroptères vivent sous les écorces d'arbres ou dans les bois, sous la mousse. Leurs moeurs et leurs métamorphoses ont été l'objet des observations de plusieurs entomologistes: Linné d'abord, puis Latreille et M. Percheron, en France". We suppose that 'Fourmilion de Percheron' figured in fig. 7 belongs to a juvenile male of *Palpares libelluloides*, reared from a larva in France, which could not be determined by Chenu due to incompletely formed longitudinal abdominal lines. A closely related immature male from Caucasus, incomplete in melanisation, was primarily referred to *Palpares percheroni* by Kolenati who later renamed this form as *Myrmeleon nordmanni* Kolenati, 1846 (fig. 8). *Myrmeleon nordmanni* is a true synonym of *Palpares libelluloides* after Hagen, 1858 and cannot be considered as any subspecific or infrasubspecific taxon in biological term.

Here is not the only case when individual immature imago among Myrmeleontidae became a cause for new name production. Similarly, series of juvenile reared specimens of *Myrmecaelurus trigrammus* (Pallas, 1781) was described as subspecies *derbendicus* Hölzel, 1972, which differs from nominative subspecies (adult imago) in having non-transparent membrane of wings that is associated with immature specimens of *M. trigrammus* in different populations (Krivokhatsky 2011).

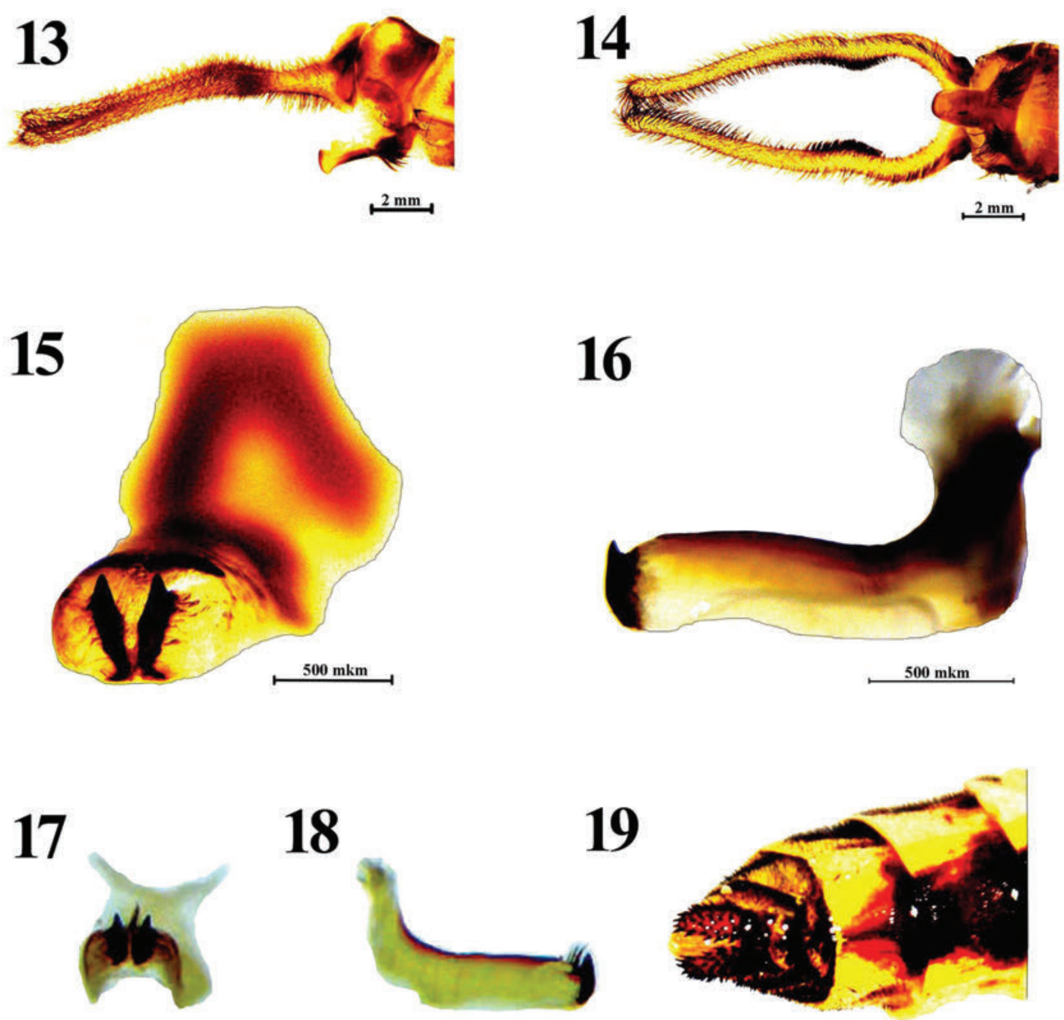
Taxonomy and nomenclature. Recently, Stange (2004: 55) has restored the primary transcription *Palpares libelloides* (Linnaeus, 1764) for the species, which was written in more than 150 science publications during 250 years under the traditional corrected name *Palpares libelluloides* (Linnaeus, 1767), which was declared by Stange as a subsequent erroneous name. The restoration of the name "*libelloides*" is likely in violation of ICZN, 1999, §11. We argued that act in the previous works (Krivokhatsky 2005). The species name *libelloides* was designated as genotype by the followers of '*libelloides*', who were aware that the other name *libelluloides* was recognized as genotype in both publications in which it was designated: Oswald and Penny (1991: 47) cited the work of Hagen (1873: 390) with "*Palpares libelluloides*", as genotype by subsequent designation, and Stange (2004: 47) listed type species *Hemerobius libelloides* Linnaeus, 1764: 401 by subsequent designation of Chenu and Desmarest (1859: 112) as "*Myrmeleo libelluloides*".

Description. Large wide-winged ant lion with reddish brown pattern. Body yellow with fulvous drawings, densely covered with hairs. Length of fore wing is 50–65 mm, hind wing – 47–62 mm, abdomen of female – 35–43, and male (with ectoproct) – 35–45 mm. The length of ectoproct is about 10 mm.

Head white, face with large fulvous spot between antennae and clypeus. Fulvous site above antennae, from which dual dark fulvous median line pass across crown and occiput and prolonged to the pronotum. Clubiform antennae short, with plane enlarged and flattened to the tip dark fulvous segments, only scapus and first segment of pedicel are pale fulvous. Scapus covered with long dense hairs. Labial palpi black, very slender, darker and thinner than maxillary palpi; they are very long, as equal as antennae. The 2nd and 3rd segments are of the same length and winding form; long fissure for the sheathing of the 3rd segment is slitting at the distal part of the 2nd segment;



Figs. 7–12. General view. 7 – 'Fourmilion de Percheron' belonging to an immature male of *Palpares libelluloides* from France (from Chenu and Desmarest 1859); 8 – *Myrmeleon nordmanni* Kolenati, lectotype male from the Caucasus; 9 – *P. libelluloides*, adult female from France (from Chenu and Desmarest 1859); 10 – *P. libelluloides*, male from Daghestan, Agach-aul, 30 June 1990, A. Zaguljaev coll.; 11 – *P. libelluloides*, male from Corfu, 'Palpares libelluluides Corfu Erber hh [Eversmann det.]'; 12 – *P. libelluloides*, male from Israel, Mt. Carmel, Isfyia env., 19 July 1996, M.G. Volkovich and M.Yu. Dolgovskaya coll. Scale bar = 150 mm (11); 140 mm (12); out of scale (7–10).



Figs. 13–19. *Palpares libelluloides*, male and female genitalia. 13, 14 – Ectoprocts of male genitalia from Mosul, laterally (13) and from below (14); 15, 16 – gonarcus with paramers of male genitalia, specimen from Mosul, from different views; 17, 18 – gonarcus with paramers of male genitalia, specimen from Iran, from different views; 19 – genitalia of female, specimen from Daghestan. Scale bars = 2 mm (13, 14); 0.5 mm (15, 16); out of scale (17–19).

an oblong sensory pit is situated at the outer side of the distal part of the 3rd segment.

Thorax yellow with brown figures, covered with pale silk hairs. Pronotum short and wide, yellow with median dark brown line widened at the basal third. The sides of pronotum also mostly brownish. Brown cervical sclerites are situated parallel to them.

Legs strong, dark reddish brown, all tarsal joints almost black. All coxes covered with dense white silk hairs, all femora and tibiae with black and white hairs and setae. Hairs placed on middle- and hind- tarsus thicker and tangled. Characteristic sensory femoral hairs absent. Spurs reddish brown, slightly curved, at all legs closely equal 1st and 2nd tarsal joints together. Claws somewhat longer than spurs, same colour and form.

Wings broad, transparent, marked yellowish red or dark brown maculae (almost black in fresh immature collection specimens), much variable in form and size, but specifically situated. Veins of Costal field

irregular, some of them furcated; black spots situated around some of them. Two more large spots ranged in scale albescence pterostigma. Longitudinal vein *RS* in both wings branched from *R* at the level of cubital fork (medial fork in hind wing). Presectoral field has 5–7 (in fore wing) or 3–5 (in hind wing) cross veins; some of them connected with adding veins, and considerable part of presectoral field looks like biserial. The point of closer longitudinal wrinkles of corrugated membrane in distal part of 2nd branch *RS* of both wings fit with facility of rhegma and could be named pseudorhegma. Genuine rhegma (point *r* at distal one third of *MP* of fore wing, or *MP1* of hind wing) looks like point of intersection *MP* and loop of confluence last branch of *RS* and basal branch *Cu* (*MP–2* in hind wing). Cubital fork (Medial in hind wing) bifurcates under 45°; lower branch *CuA* (*MP–2* in hind wing) arcuated before confluence with the border of wing.

1A simple, *2A* and *3A* branched. *CuA* of hind wing, going parallel with *MP–2* at the base, then forming abruptly the loop in the direction of upper branch of Median fork, then intersecting *MP–2* and connecting with one of longitudinal veins into the fork. Vein *CuP+1A* of hind wing has 4–5 branches, reached the border of the wing, *2A* – simple, *3A* – branched. Anterior Banksian lines present, posterior Banksian lines invisible in both pairs of wings. Axillar plates in the base of hind wings of males are developed. Abdomen yellow, with three brown longitudinal tergal (medial and two lateral) lines.

The variation of size and form of basal brown macula of hind wing remarkable, with small macula (Fig. 10) located short distance from Median fork, middle-sized macula (Fig. 11) spreading up to MP_1 and large one (Fig. 12) ranging in scale both forks, Cubital and Sectoral.

These three groups of maculae are rather provisional; there are no conjugate features in wing pattern.

Small and middle-sized maculae occur usually in smaller insects with a length of fore wing 50–58 mm; large, combined macula is characteristic of ant lions with fore wing from 56 to 65 mm long. Usually, one type of maculae predominated on the specimens within local population. In the following list, the data of collection specimens (ZIN) with different types of maculae are shown:

Italy – middle (1 specimen);

Greece – small (1), middle (1);

Montenegro – small (1);

Croatia – middle (1);

Northern Iranian provinces (Iranian Azarbayjan, Tehran) – small (4 spp.);

Southern Iranian provinces (Bampur, Sargad) – middle (1), large (2);

Bulgaria – small (1);

Dagestan – small (1);

Azerbayjan – small (1); middle (2); large (2, at Lenkoran only);

North Armenia – small (1), middle (1);

Armenia, Arax – small (1), middle (2);

Turkey – small (1), middle (3), large (2);

Israel – small (3); middle (1).

Coloration of wings within population is usually uniform. In one series of 6 specimens, collected in environs of Elisavatpol on 30 June 1913 by A. Bartenev only one male is coloured with reduced pale points.

Brown longitudinal tergal lines usually become wider toward to the tip of the abdomen, and sometimes it seems that in two or three last segments brown rings are present similar to *hispanus-turcicus*. In ZIN collection, these features were present in one male of *P. libelluloides* with the label 'Bartis on Arax, 3.06.1914, von Vik' and one male from Agach-aul, Dagestan. Nevertheless, these wings have a small basal cubital macula that does not stretch to the radial fork of the hind wing, which is considered as a possible alternative for *P. libelluloides* and an impossible characteristic for *P. turcicus*. Atypical males are small and belong to the range of wings lengths of the first species.

The largest specimen in ZIN collection with typical figures on the abdomen and wings is a female from Iran, North slope of Kuhi-Taftan, 25 May 1955, D. Shteinberg leg.; forewing about 68 mm.

Genitalia. Ectoprocts (Figs. 13, 14) of male about 10 mm long, evenly covered with black erected hairs, arcuated, with the callus at the inner side of basal third. Sternite VIII spoon-shaped form. Gonarcus (Figs. 15–19) tubiform with embedded conjugate parameres on the tip. The presence or lack of hairs between parameres are individual features (Figs. 15–18), and variable within the *P. libelluloides* group. Pyramidal hypandrium internum placed deeper and separates from gonarcus. Genitalia of female (Fig. 19) with developed anterior and lateral gonapophyses.

Diagnosis. Within the species group *P. libelluloides*, the nominative species has been distinguished by three brown longitudinal lines on the yellow abdomen. The picture of abdomen of *P. hispanus*, *P. aesh-*

noides and *P. turcicus* is made of transversal brown rings on each segment; size differences between three species are evident. The rings are closed-loop at the last segments of the abdomen, basically they look like broken arcs but never like broken lines, characteristic of immature '*nordmanni'* of *P. libelluloides*.

Allopatric *P. geniculatus* and *P. speciosus* are characterized by entirely yellow abdomen without brown pattern. In the old specimens, abdomen can be darkened, but pattern is not developed.

Palpares turcicus Koçak, 1976

Palpares hispanus turcicus Koçak, 1976: 97; Aspöck et al. 1980: 284 (as = *M. libelluloides*); Aspöck et al. 2001: 226 (as = *P. hispanus*); Stange, 2004: 53 (as = *P. hispanus*);

Palpares turcicus Koçak – Koçak et al., 1995: 6; Krivokhatsky, 2011: 95.

Material. (44 specimens examined).

IRIPP: 3 males, 1 female: Iran, Hamadan Prov., Avaj. 2080 m Alt., 11 August 1996, Parchami, Barari; 2 males: Iran, Kordestan Prov., Sanandaj, Ariz., 2200 m Alt., 5 June 1972, Mirzayans, Abai; 1 male: Iran, Alborz Prov., Asara, 27 June 1971; 1 female: Iran, Lorestan Prov., Droud, Darbastaneh, 1750 m Alt., 4 August 1997, Mofidi, Barari; 1 female: Iran, Tehran Prov., Taleghan, Tijkuh., 1950 m Alt., 9 July 1997, Mofidi, Barari; 1 male, 2 females: Iran, Zanjan Prov., Zanjan, Youkhari Chay, 1660 m Alt., 7 July 1997, Mofidi, Barari; 2 females: Iran, Markazi Prov., Norbaran, Sangak., 2100 m Alt., 20 August 2009, Hajiesmailian, Mofidi; 3 females: Iran, Tehran Prov., Taleghan, Kalanak., 1800 m Alt., 26 June 1991, Ebrahimi, Badii.

ZIN: Armenia: 1 male, Armenia, Khosrov, 12 July 1864 (anonym); 1 male, 3 females, Armenia, Noravang Mon., Daralagez Range, Gaishik R. Valley, 1100 m, 27 July 2003, A. Koval;

1 male, 2 females, Armenia, Meghri, 26, 30 June 2010, M.G. Volkovitsh;

Azerbaijan: 2 males, 1 female, Nakhichivan, Paraga, NW of Ordubad, 19, 20 June 1933, D. Znoiko; 2 males, 3 female, Nakhichivan, Paraga, NW of Ordubad, 28 June 1933, D. Znoiko, '*Palpares hispanus*, E. Luppova det.'; 1 female, Nakhichivan, 1933 (D. Znoiko); Ordubad, Arax valley, 14 July 1933, D. Znoiko; 1 female, Nakhichivan, anonym; 1 female, Mugan, East Transcaucasia, no date, anonym (small, faded specimen);

Iran: 1 male, W. Azarbayjan. Vazzaran env., 23–24 July 2004, V. Lukhtanov; 1 female, W. Azarbayjan. Tacht-e-Suleiman, 31 July 2004, V. Lukhtanov; 1 male, Zanjan prov. 15 km SW Zanjan, 12 July 2004, V. Lukhtanov; 1 male, Zanjan prov. 20 km NE Zanjan, 26 July 2005, V. Lukhtanov;

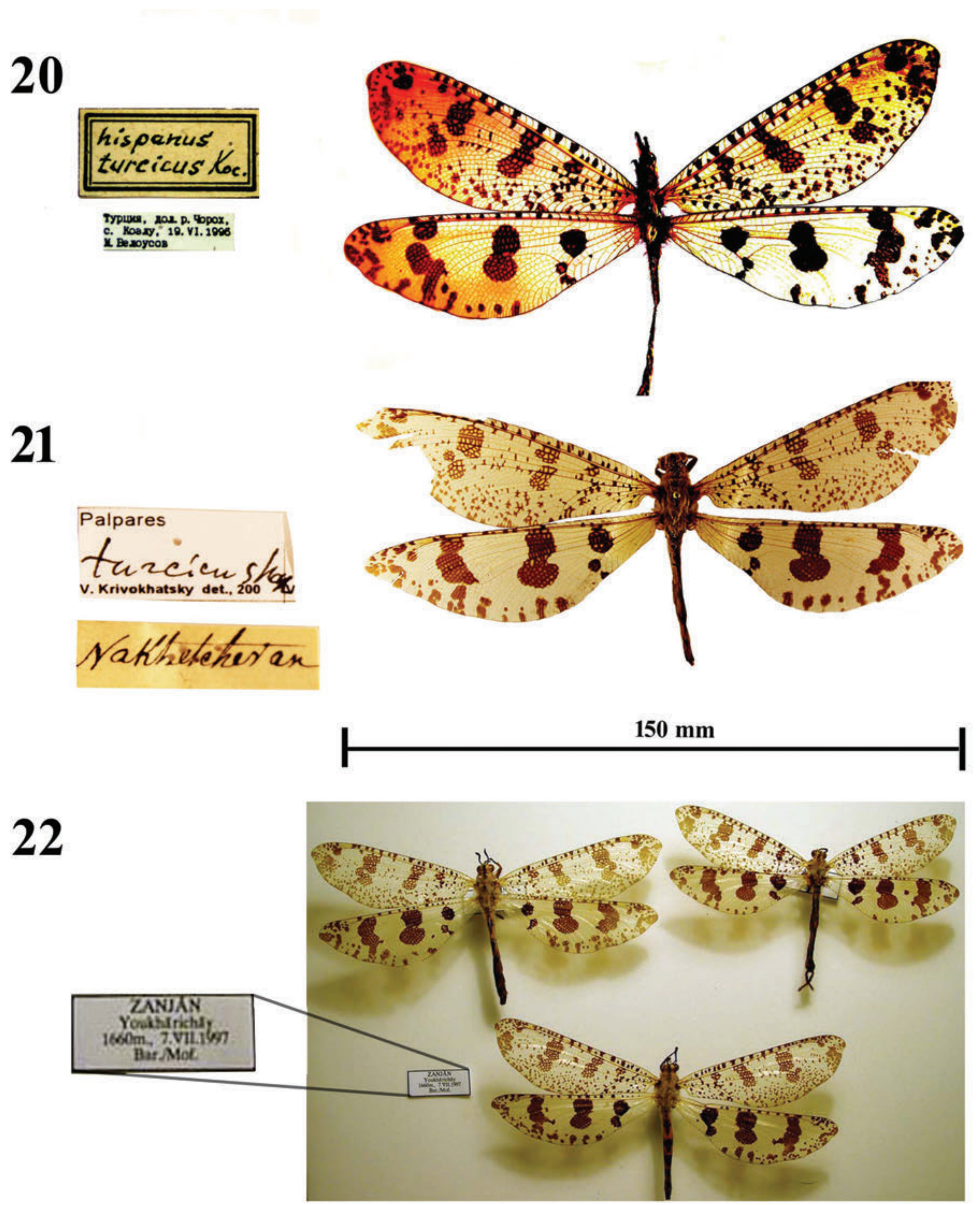
Turkey: 1 male, Turkish Armenia, Range kurtykdag near Mush, 22 May 1916, V.A. Kuchinskyi; 2 males, Turkish [Armenia], Kozlu v., Chorokh R. valley, 19 June 1996, I.A. Belousov.

Distribution. Asia: Armenia, Azerbaijan, Israel, Syria, SE Turkey, W Iran.

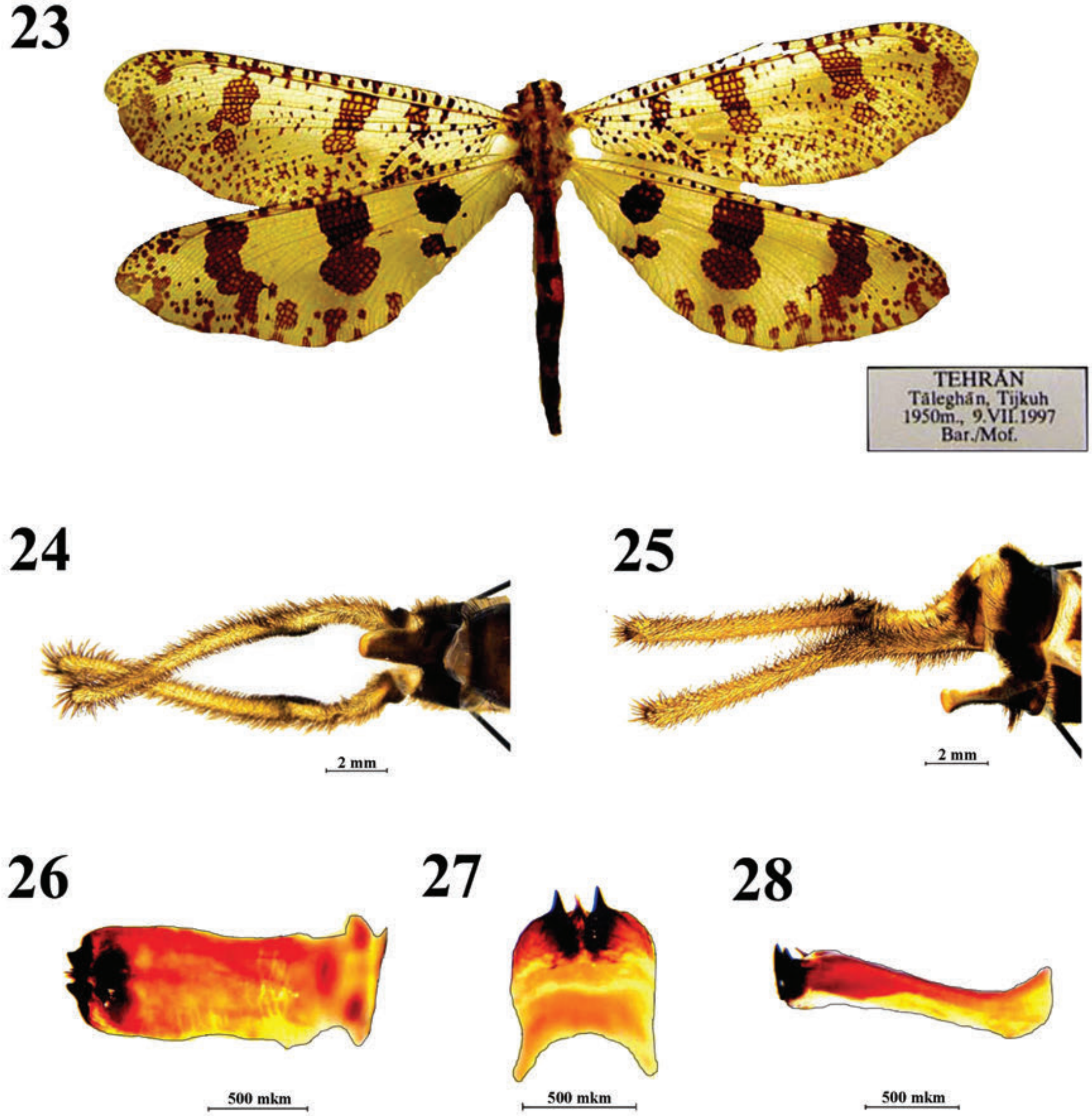
Diagnosis. The largest species within the subgroup with abdomen, drawing with brown rings in yellow segments. The sectoral macula in hind wings various sized: from small speck upon cubitus (Fig. 20) to large macula, covering both forks (Fig. 21).

Taxonomy and discussion. *Palpares chrysopterus* Navás, 1912 was synonymized to *P. libelluloides* by N. Banks (1913: 183). By the way Banks wrote: "*P. chrysopterus* Navás is the same or a slight variety" for *Palpares libelluloides*, not for *Palpares hispanus*, which was discussed in the previous page (Banks 1913: 182).

That synonymy, for *Palpares libelluloides* s.l., was accepted in the catalog "Die Neuropteren Europas" (Aspöck et al. 1980). In a later publication of Ábrahám (2012), the name *P. chrysopterus* was excluded from synonyms of *P. libelluloides*, declared by him as valid, and *P. libelluloides turcicus* has been synonymized with it. We cannot accept that taxonomical act because *Palpares chrysopterus* was described as broken name and cannot be accepted as valid and appropriated. In the first publication (Navás 1910), cotypes (sic!) of males from the Madrid Museum have been described and male ectoprocts (from Madrid) and female wings (from the Paris Museum) have been figured. In the second publication (Navás 1913d), *P. chrysopterus* sp. nov. (again!) has been described on the base of female without reference to the previous publication or the examined male specimens. The type localities in both descriptions are different as well as type depositories. There were two nomenclature series as well: 1) "chrysopterus, 1910", male: Razouft, Haut Icaroum; Museo de Madrid; 2) "chrysopterus, 1913", female: Kourdistan de Sineh; Museo de Paris. Despite the decision of Ábrahám (2012) about affiliation of both descriptions with one systematical taxon, we declare that the name *Palpares chrysopterus* Navás, 1910 and 1913 to be a broken name, and synonymize with doubt this invalid name with *Palpares hispanus turcicus* Koçak, 1976, recently *P. turcicus*.



Figs 20–22. *Palpares turcicus*, general view. 20 – Male from Turkey, Kozlu v., Chorokh R. valley, 19 June 1996, I.A. Belousov; 21 – female from Nokhichevan, old ZIN collection; 22 – 1 male, 2 females from Iran, Zanjan Prov., Zanjan, Youkhari Chay, 1660 m, 7 July 1997, Mofidi, Barari. Scale bar = 150 mm (20, 21); out of scale (22).



Figs. 23–28. *Palpares turcicus*. 23 – Female from Tehran, general view; 24, 25 – male from Turkey, No. 3, ectoproctes; 26–28 – specimen from Turkey, male genitalia. Scale bars = 2 mm (24, 25); 0.5 mm (26–28); out of scale (23).

The name *Palpares chrysopterus* has been recorded by Ábrahám (2012) for the "Armenia, [Turkish Armenia (sic)!], Israel, Syria, SE Turkey, W Iran". Valid name, *P. turcicus* is used here out of Turkey for the first time.

Ecological notes. In IRIPP, the representative collection of *Palpares* specimens has been accumulated, collected by several entomologists in ten provinces of Iran. The analysis of this material results in conclusion that *P. libelluloides* and *P. turcicus* are sympatric in northern provinces, but never inhabit the same and closely related localities. Moreover, we did not find the specimens that could be rated like hybrids between *libelluloides* and *turcicus*. At the collection of ZIN there are a lot of *Palpares* specimens, collected by famous Russian scientists, investigators

of Caucasian fauna. Like in Iran, there are no mixed collections from one locality in Caucasus. Consequently, the pattern of distribution for *P. libelluloides* and *P. turcicus* in the zone of their sympatry can be characterized by avoidance of the same biotopes and isolation from one another at the landscape level.

The smallest (fore wing is nearly 51 mm), faded specimen – is female, collected in Mugan; the largest one is one female, Nakhichivan, 76 mm (Fig. 22) (both – ZIN collection of the 19th century). In contrast to *P. libelluloides*, basal macula in the hind wing has a circular form and covers both sectoral and cubital forks.

Coloration of wings and dimensional subgroup within population are usually uniform (Fig. 22), the largest ones were collected in the Arax river valley (Fig. 21) at the beginning, and in Tehran (Fig. 23) at the end of the 20th century.

Genitalia. Ectoprocts as well as inner genital construction (Figs. 25–29) are principally similar with *P. libelluloides*.

Palpares hispanus Hagen, 1860

Palpares libelluloides var. A – Rambur, 1842: 368; Hagen, 1866a: 456; McLachlan, 1873: 128 (syn.); *Palpares hispanus* Hagen, 1860: 40; 1866a: 456; 1866b: 288; 1873: 255; Pictet, 1865: 76; McLachlan, 1867: 275; 1873: 444; 1882: 172 (?= *M. libelluloides* L.); 1898b: 151 (valid); Brauer, 1876: 289; Kolbe, 1884: 135; Navás, 1902a: 103; 1904b: 10; 1906a: 14; 1907a: 100; 1911a: 265; 1911d: 240; 1912r: 21; 1913h: 113; 1914g: 749; 1914o: 7; 1915a: 119; 1921b: 292; 1922a: 17; 1925d: 22; 1928c: 43; 1929e: 16; 1929j: 57; 1935b: 78; 1935e: 78; Banks, 1911: 4; 1913a: 182; Stitz, 1912: 105; Esben-Petersen, 1918: 106; Morton, 1925: 405; Hölzel, 1972: 8; Steffan, 1975: 35; Monserrat, 1979b: 410; 1982: 70; Aspöck et al., 1980: 283 (= *M. libelluloides* L.); 2001: 226 (valid); Monserrat, Diaz-Aranda, 1987: 175; Diaz-Aranda, Monserrat, 1888a: 215; Krivokhatsky, 1998b: 86; 2011: 95; Stange, 2004: 53.

Distribution. Europe: South Spain, Portugal, Africa: Morocco, Algeria, Tunisia, Libya.

Material. (12 specimens examined).

ZIN: Spain: 1 female, "*Myrmeleon libelluloides* Lin. Andalusia" (handwriting by L. Navás), '*Palpares hispanus* Rmb., Kriv. det.'; 1 female, '*Palpares rufipes* Motsch., Andalusia' (handwriting by V. Mochulskyi; preparation of genitalia by V. Krivokhatsky), '*Palpares hispanus* Rmb., Kriv. det.';

Italy: 1 male, '*Palp. papilionoides*, Neapel, Staudinger', '*Palpares libelluloides* L. Luppova det.', '*Palpares hispanus* Rmb., Kriv. det.';

Algeria: 1 female, Algerie, [18]60 (Shtrauch), + green small square; 1 female (?), Algerie, [18]60, C. Morawitz; 2 females, Aumale, Algerie, [18]60, Solskiy;

Tunisia: 1 female, Tunisia, Kertzan Mt., 30 June 1986 (Molchanov), '*Palpares libelluloides* A. Zakharenko det.', '*Palpares hispanus* Rmb., Kriv. det.';

Morocco: 2 males, 1 female, 'Marocco, 1900 (Vaucher)', '*Palpares hispanus* [Kolbe det.]' (handwriting by H. Kolbe); 1 male, 'Marocco, S.O. Inscibeio, 22 March 1902, Rüggenbach'; 1 female, 'Ain Defali, Marocco bor., 12 June 1929, A.O. Birulya'.

Taxonomical notes. Two specimens of ZIN collection have correct determination by H. Kolbe after 1900, but remain unpublished (Kolbe 1884). Syntypes from Tunisia, Abart, in BMNH.

At the localities of *P. libelluloides*, var. A Rambur (1842, p. 268) recorded "*l'Andalousie et du cap de Bonne-EspéranceAndalusia*". It is likely that this locality ('Cape Bon Peninsula, Tunisia [currently Capetown]') was a roving error and 'Cape Bona Spei' in South Africa caused a propagation error in subsequent publications for *Palpares hispanus*. McLachlan (1873, p. 129) also wrote that Cap de Bonne-Espérance «si l'étiquette n'est pas erronée» for *P. hispanus*.

Except for the original description (Hagen 1860: 40), there were many comparative descriptions of collecting samples from different localities. Almost all specimens examined in Africa (Fig. 29) and Europe (Fig. 30) are practically similar in appearance and coloration. Forewings of Moroccan specimens are about 50–58 mm. It seems that specimens in North African populations were shrinking from west toward east prior to particular species *Palpares aeshnoides* separated from them in Ancient Egyptian Basin. At the same time, wide Balkano-Appenine disruption between European part of areal of *Palpares hispanus* and East-Mediterranean populations of *P. turcicus* is obvious.

Genitalia. Ectoprocts as well as inner genitalia (Figs 31–35) are characteristic for the *P. libelluloides* group.

Palpares aeshnoides (Illiger, 1807)

Myrmeleon aeshnoides Illiger in Rossi, 1807: 17;

Palpares aeshnoides (Illiger, 1807) – Hagen, 1866a: 435, 450 (as ?= *libelluloides*); 1887: 110 (non = *papilionoides*); Brauer, 1876: 289 (as ?= *libelluloides*); Klapálek, 1906: 96; Krivokhatsky, 1998: 25 (figs); 2011: 95; Stange, 2004: 48.

Palpares assyriorum Ábrahám, 2012: 89; syn. nov.

Distribution. Asia: Syria, Jordan, Iran, Turkey, Israel, Arabian Egypt; Africa(?): Egypt. It occurs in East-Mediterranean, Syrian plain, and Front-Asian provinces of two zoogeographic Regions. Wide Levantine type of distribution.

Material. (7 specimens examined).

ZIN: Palestine: 1 male, 1 female, Palestine, 1900 (Schlüter), Ameisenlowe, Jerusalem, 16 May 1900; 1 female, Palestine, 1900 (Schlüter), Ameisenlowe, Jerusalem, 16 May 1900, "libelluloides var aeschnoides Ill"; 1 male?, Jereusalem, Palestina. [18]96 (N.M. Romanov), head broken; 1 sp.?, Jereusalem, Palestina, [18]96 (N.M. Romanov), abdomen broken.

USMB: Israel: 1 female, Camp Ziouani – en Zivani (Holan hills), March – April 1996, R. Rosa.

Comparative description. The smallest species within the species group with ringed abdomen, approximately twice less than *P. turcicus* (compare Figs. 21 and 38). The length of the forewing of specimens from ZIN (Grand duke Romanov's collection, Figs. 38, 39, 41, 43) is about 30–35 mm.

The photographs of inner male genitalia (Figs. 44–48) were prepared by A. Medvedev using a long exposition of the tip of the abdomen in KOH solution, so that hypandrium internum became transparent and was not fixed. We also examined genitalia of the males from the same series with a preparation treated in glycerol, there were identified both gonarcus with parameres and hypandrium internum, depicted by Krivokhatsky (1998) (Figs. 41, 42).

Illiger in Rossi (Rossi 1807: 17) under the headline name 689. '*M. libelluloides*' named "Drury Ins. 1, t. 46". Then after '*Libella turcica* Petiver', he pointed female "*M. Aeschnoides* Mus Helww. Hoffm." In next paragraph, Florentine *M. libelluloides* has been described, and comparative description of *M. aeschnoides* has been prolonged to the next page. Details of description, "Abdomen citrinum nigro-lineatum", agree with description of Drury, and indicate *P. libelluloides* s. str. Size of both descriptions could not belong to small species too: In Drury, 1770: 210 "Fig. 1, Expands about four inches and three quarters" [120.5 mm], and in Rossi (1790: 14 and 1807: 17) – "long 26 lin." [56.16 mm].

That is evident that available picture coloured by Drury (1770) and described by him and Illiger in Rossi (Rossi 1807) belongs to the male, not female, recorded as the specimen, associated with the name "♀ *M. Aeschnoides* Mus Helww. Hoffm." (Rossi 1807: 17). In accordance with Article 73.1.4, the specimen's picture figured by Drury (1770) and described by Illiger (in Rossi 1807), was the type of *Myrmeleon aeschnoides*; despite that it was lost, like many other collections of Rossi.

Levente Ábrahám (2012: 82) wrote that the species was not described due to the nomenclatural ambiguity in the literature and the current status of the taxon is invalid: "It can be concluded after all, that the name of *P. aeschnoides* is a nomen nudum. Based on the work of Hagen (1858), the name is reoccurring in the neuropterological literature, and the taxon, significantly different from *P. libelloides* or *P. hispanus* was only revealed by some entomologists investigating the fauna of Middle East and the eastern Mediterranean". Unlike Ábrahám, Illiger (Illiger in Rossi 1807: 17) indicated that name as a "naked name" from Europe, but described it correctly [!] with complex morphological features on pages 17–18, based on picture of Drury ("*M. aeschnoides* nobis audit, a Drury l. c. depicta") from Turkey.

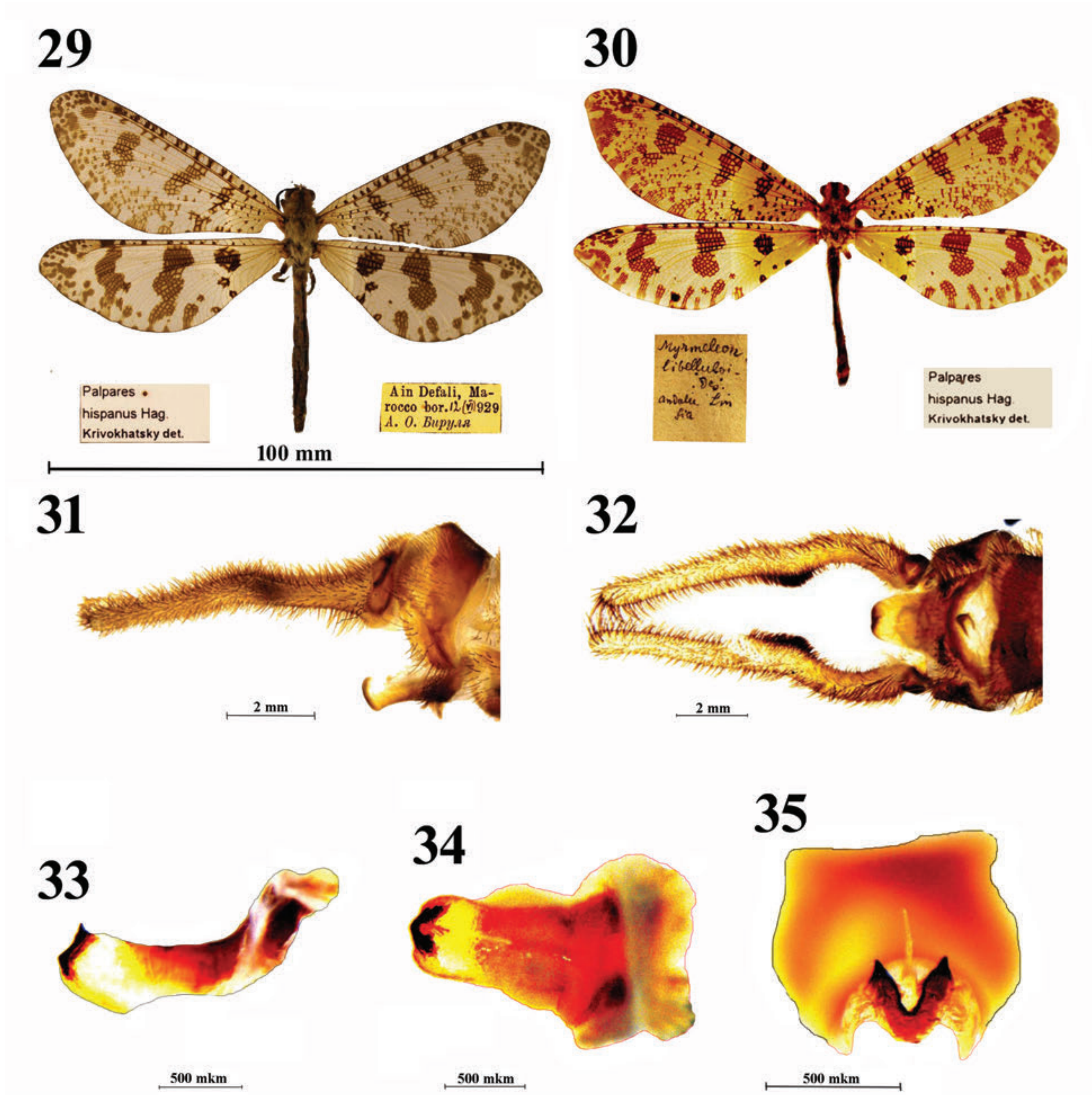
Next expression of Ábrahám (2012: 78) was: "In the second half of the 19th and the first half of the 20th century the name *Palpares aeschnoides* seemed to cause major misunderstandings among the neuropterologists, especially when they tried to determine the specimens from the Middle East. Our answer is very simple: there were no specimens for determination in that period!" This was used as a justification that permitted him to make an unnecessary description of a new name for a well-known species.

The description *M. aeschnoides* of Illiger (Illiger in Rossi 1807: 17) is based on the picture taken by Drury (Drury 1770) from Smirna. Next imagery of that specimen has been determined by subsequent neuropterists as *aeshnoides* and was figured in Sawigny (1809) based on male, collected during the Napoleon expedition in Egypt.

Synonymy. A synonymy of *Palpares assyriorum* Ábrahám, 2012 with *Myrmeleon aeshnoides* is preliminary here because we know only of one paratype, determined before, in 2000, with the label "*Palpares aeshnoides* (Illiger), Krivokhatsky det.". Holotype and other paratypes were not examined.

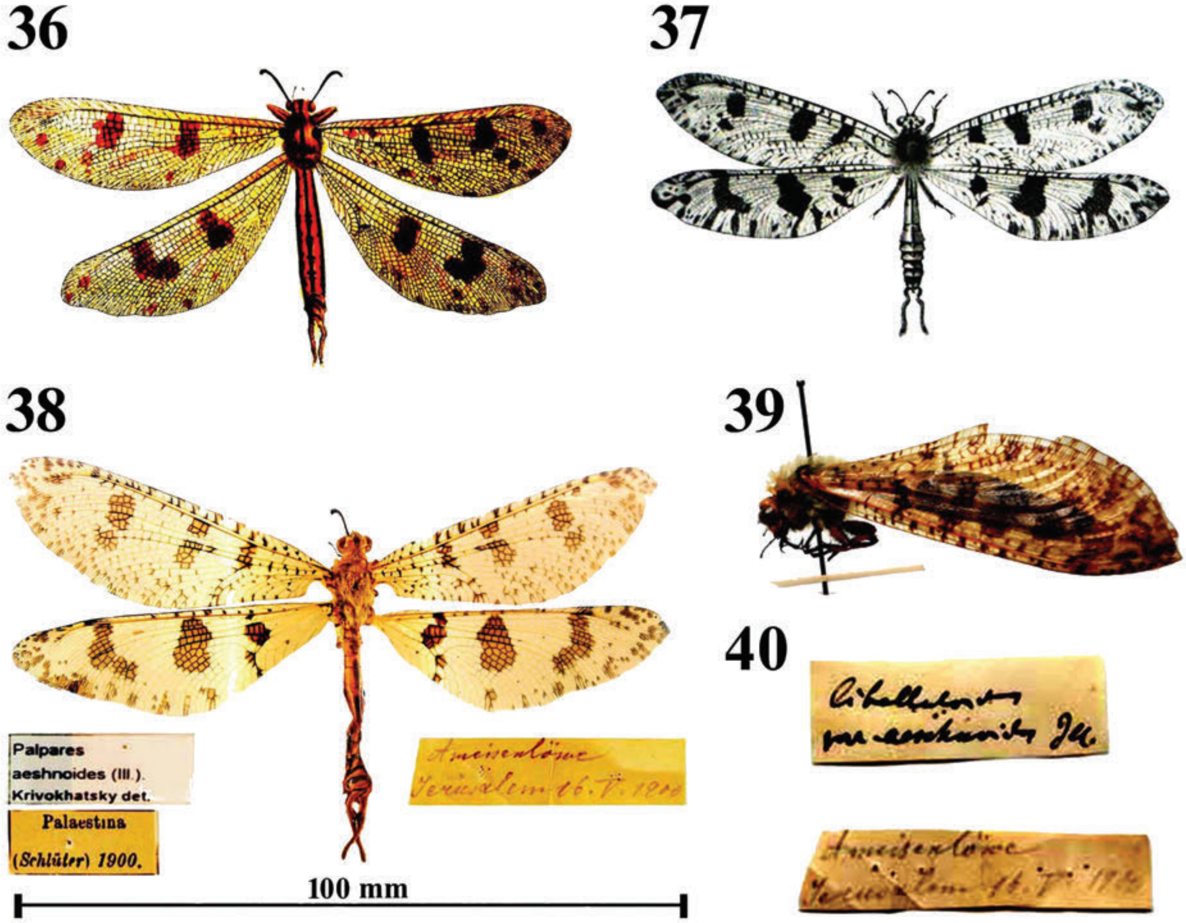
Consequently, when Ábrahám prepares to describe a new name, he must know at least one specimen, determined as *aeshnoides in* "the second half of the 19th".

Colour imagery of Drury (1770: fig. 36) is very schematic, but the drawing of Savigny (1809: fig. 37)



Figs. 29–35. *Palpares hispanus*. 29 – Female from 'Marocco, general view, 1900 (Vaucher)', '*Palpares hispanus* [Kolbe det.]'; 30 – female, '*Palpares rufipes* Motsch., Andalusia' (handwriting by V. Mochulskyi), '*Palpares hispanus* Rmb., Kriv. det.'; 31–35 – male genitalia, Marocco. Scale bars = 100 mm (29, 30); 2 mm (31, 32); 0.5 mm (33–35).

preserved diagnostic features like the shape of spots on the wings and abdominal rings. There are good diagnostic series of unique specimens from the centre of that species distribution (between Turkey and Egypt), preserved in ZIN collection. For the purpose of stability of nomenclature and in accordance with the Article 75.3 of ICZN (1999), authors consider that the designation of a type is necessary to define objectively, and one of the specimens from named series is designated here as the neotype. That is a male, Palestine, 1900 (Schlüter), "Ameisenlowe, Jerusaem, 16.05. 1900", (label handwriting by N.M. Romanov).



Figs. 36–40. *Palpares aeshnoides*, general view and labels. 36 – From Drury (1770); 37 – from Savigny (1809); 38 – neotype; 39, 40 – first specimen of series (female), collected and determined by Grand duke Romanov in ZIN collection (39), with handwriting of N.M. Romanov (40). Scale bar = 100 mm (38); out of scale (36, 37, 39, 40).

In accordance with the Article 76.3, the type locality is Jerusalem.

Palpares geniculatus Navás, 1912

Palpares geniculatus Navás, 1912: 216; 1926d: 112; 1929e: 16; Banks, 1913a: 181; Simon, 1979 (diss.); 1988 (diss.); Aspöck and Hölzel, 1996: 68; Krivokhatsky, 1998b: 17; 2011: 95; Aspöck et al., 2001: 227; Whittington, 2002: 385; Stange, 2004: 52.

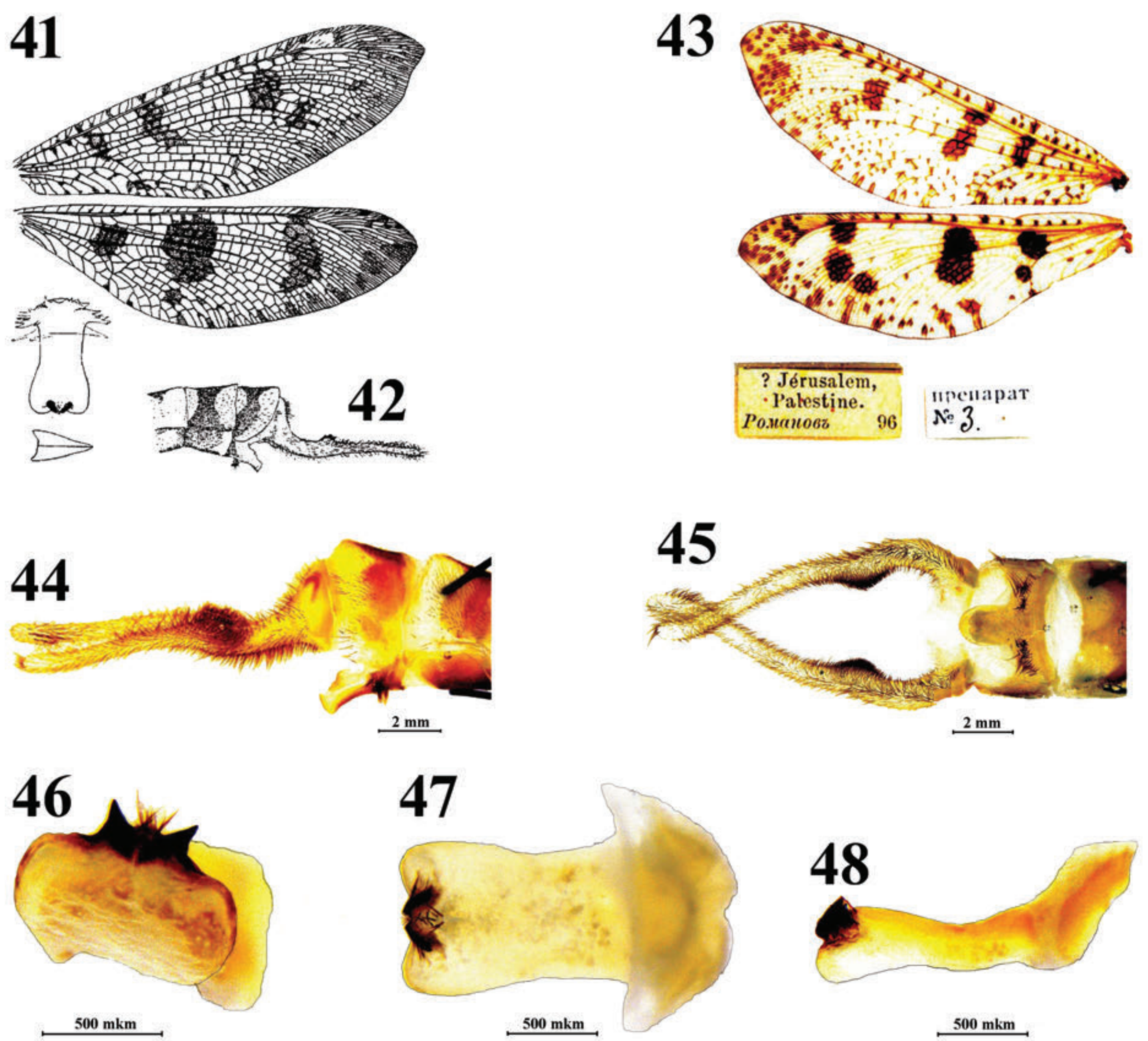
Material. (5 specimens examined).

ZIN: Israel: 1 male, 4 females, Akhziv env., West Galilee, Mediterranean Shore, 29 July 1996. M. Volkovitsh, M. Dolgovskaya;

Distribution. Lebanon, Israel, Palestine, Libya, Egypt, Ethiopia. Adventive Northern-Afro-subtropical species *Palpares geniculatus*, whose descendants penetrated to the South-African (Cape) subtropics, using intrazonal quasi-eremian biocenoses during the climatic crisis in the late Miocene (Kovalev 1995). Evidently, it may be considered as sister and reflecting species with respect to South-African *P. speciosus*, separated from each other by the tropical zone.

Type from Agami (Egypt).

Comparative description. Entirely yellow unlined abdomen should be attributed in one subgroup with *P. speciosus*. Basal brown macula of hind wing (*B. m.* at the Fig. 1) is unique within the group: it forms a narrow stria along mediana slightly touched with *MP*. Male and female are closely similar in size and appearance (Figs. 49, 50). Ectoprocts of male more straight, than in other species, but covered with



Figs. 41–48. *Palpares aeshnoides*. 41–43 – Wings, ectoprocts of male, gonarcus with paramers and hypandrium internum of male from the same series with preparation, treated in glycerine, drawings (41, 42) depicted by Krivokhatsky (1998) and photo (43); 44 – ectoprocts of male; 45–48 – male, gonarcus with parameres. Scale bars = 2 mm (44, 45); 0.5 mm (46–48); out of scale (41–43).

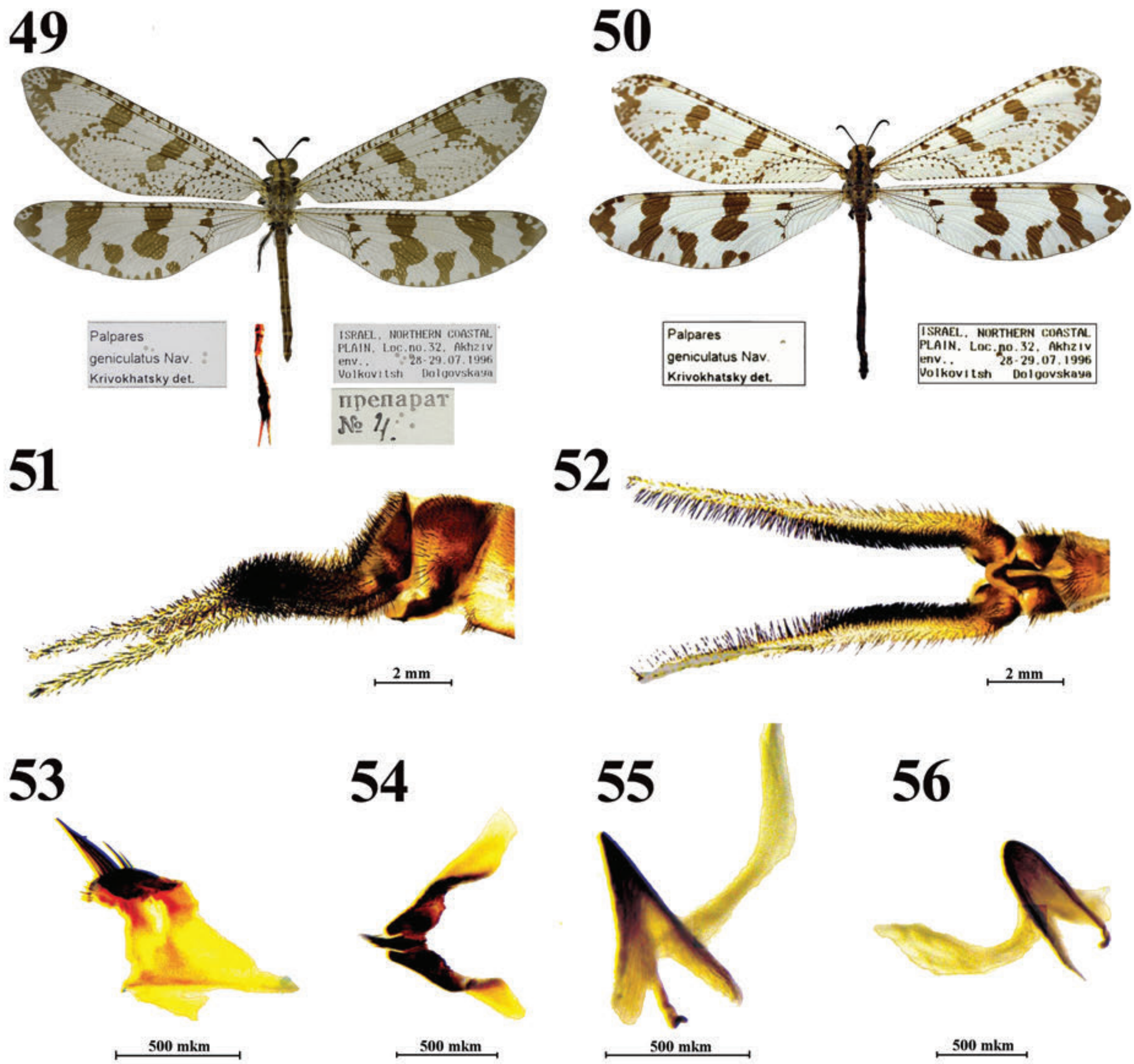
dense hairs at the place of inner projection (Figs. 51, 52). Genitalia (Figs. 51–56) have been prepared in high concentration of KOH; as a consequence of such conditions the maceration of muscles inside gonarcus increases, and the cone-shaped gonarcus after a long exposition in KOH looses the pyramidal form and becomes transparent (Figs. 53–54). Hypandrium, analogously, from diamond-shaped became a transparent structure with a typical myrmeoleonid crescent shape, compared with a small arc and prolonged membranous tail (Figs. 55, 56).

Palpares speciosus (Linnaeus, 1758)

Hemerobius speciosus Linnaeus, 1758: 912; 1788: 2640 (as prob. syn. of *M. libelluloides*); Fabricius, 1784: 398 (as prob. syn. of *M. libelluloides*);

Myrmeleon maculatum DeGeer, 1773: 505 (name); Fabricius, 1784: 398 (as syn. of *libelluloides*); Olivier, 1811: 121; Hagen, 1866a: 444 (syn.); Dalman, 1823: 89 (as syn. of *M. leopardus*);

Myrmeleon leopardus Sulzer, 1776 (Tab. XXV, fig. 3) – Dalman, 1823: 89 (syn. of *maculatum*);



Figs. 49–56. *Palpares geniculatus*. 49, 50 – General view: male (49; specimen without posterior part and its posterior part), female (50); 51, 52 – male ectoproctes; 53, 54 – male, gonarcus with parameres, different views; 55, 56 – male, hypandrium intermum. Scale bars = 2 mm (51, 52); 0.5 mm (53–56); out of scale (49, 50).

Myrmeleon speciosum (Linnaeus) – Olivier, 1811: 121;

Myrmeleon speciosus (Linnaeus) – Dalman, 1823: 89 (incorrect syn. of *libelluloides*); Charpentier, 1825: 51; Walker, 1853: 306 (with syn. *M. leopardus* Dalman, 1823);

Myrmeleon leopardus Dalman, 1823: 89; Walker, 1853: 306 (syn. of *P. speciosus*); Stange, 2004: 60 (syn.);

Myrmeleon maculatus DeGeer – Walker, 1853: 404 (syn.?);

Myrmecoleon speciosus (Linnaeus) – Burmeister, 1838: 998;

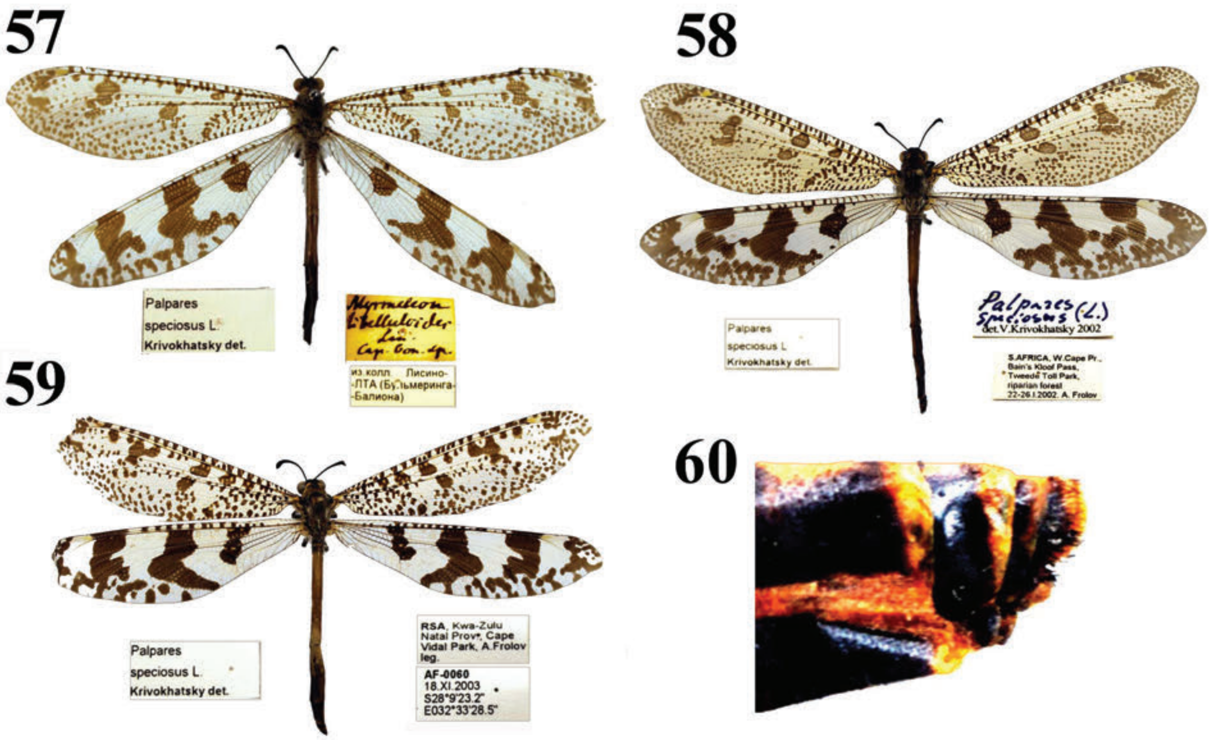
Palpares speciosus (Linnaeus) – Rambur, 1842: 370; Hagen, 1866a: 448, 457; McLachlan, 1867: 275; 1873b: 129; Banks, 1911: 4; 1913a: 184; Navás, 1912r: 21; 1921b: 293; 1929a: 444; Mansell, 1990a: 187; 1992: 246; 1999: 50 (photo); Mansell, Erasmus, 2002: 176 (photo); Whittington, 2002: 385; Stange, 2004: 60; Krivokhatsky, 2011: 95;

Palpares leopardus (Dalman) – Hagen, 1866: 442, 456; Gerstaecker, 1893: 116;

Palpares speciosus capensis Navás, 1923b: 432.

Distribution. RSA. Distributed in Capense subtropical province exclusively.

"The first important stage in the formation of a desert biota is assigned to the period of an ap-



Figs. 57–60. *Palpares speciosus*. 57–59 – females: '*Myrmeleon libelluloides* Linn., [Cap Bona Spei]' (H. Hagen handwriting) (57), Tweede Tool Park, reparian forest, 22–26 January 2002, A. Frolov coll. (58), Kwa-Zulu Natal prov., Cape Vidal Park, 18 November 2003, A. Frolov coll. (59); 60 – female genitalia. Out of scale.

proximately simultaneous emergence of vast areas supporting semi-desert in the Oligocene-Miocene. In the Early and Middle Miocene, a more severe semi-desert regime with a rate annual rainfall of 200–300 mm was established in Middle and Central Asia" (Kovalev 1995). Kovalev believes that East-Mediterranean biota could have penetrated southern Africa through the eastern coast in the late Miocene, when the arid zone expanded considerably and true deserts with less than 200 mm of rainfall per year appeared in Arabia.

Therefore, we are inclined to believe that the dispersal of *P. speciosus* in Africa was rather related to the global climatic crisis in the Pontain (=Messinian) Age (7.2–4.7 Ma). The late Pontain global aridization of climate brought about an abrupt expansion of the zones of deserts and semi-deserts. In the equatorial zone, it led both to a replacement of rain-forests by savannahs and spreading tugai vegetation in river valleys.

Material. (3 specimens examined).

ZIN: RSA: 1 female, 'Myrmeleon libelluloides Linn., Cap Bon. sp. [Cap Bona Spei]' (H. Hagen handwriting); 1 female, Kwa-Zulu Natal prov. Cape Vidal Park, 18 November 2003, A. Frolov;

1 female, W. Cape prov., Blain Kloof Pass, Tweede Tool Park, reparian forest, 22–26 January 2002, A. Frolov.

Comparative description. The species of South African fauna, distinctively belong to the *P. libelluloides* sp. gr. Basal brown macula of the hind wing (*B. m.* in fig. 1) is variable, usually has a form of a transversal band (Figs. 57–59). Male was not examined, so female genitalia are only presented in Fig. 60.

Notes. Ábrahám (2012) wrote that he had spotted the specimen No. 2352 at the collection of the Linnean Society of London with two labels "papilionoides" and "libelluloides. 913", and it must be the type of *Hemerobius speciosus* Linnaeus, 1758 with lectotype statement. We are not convinced by his comments. Ábrahám (2012) cited that the description of the type has an earlier date (Rösel, 1740). It

is impossible to find the type or the housing museum, where the type material is preserved. Article 75.3 of ICZN (1999) urges to designate the neotype of the species. The specimen (without the tip of the abdomen) from the Linnean collection, No. 2352, depicted by Ábrahám (2012), is designated here as the neotype of *Hemerobius speciosus* Linnaeus, 1758.

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